

THE SPRING MOULT OF *LARUS ATRICILLA* LINN.

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*Plate IX.*

THE subject of the alleged color change in full-grown feathers in certain specific cases, would seem hardly worthy of renewed comment after the thorough papers of Allen and Chapman in the 'Bulletin' of the American Museum, Vol. VIII, 1896, pp. 1-44, and of others since then. But judging by analogous biological problems, it is only by reiterated and absolutely overwhelming proof, that any theory, which has once gained wide credence, can be refuted.

With this intent I offer a few brief notes made in a series of weekly observations on the spring moult of the head and neck of an individual Laughing Gull (*Larus atricilla* Linn.), which, brought as a nearly hatched embryo three years ago from Cobb Island, Virginia, was hatched and reared in the New York Zoölogical Park, and has assumed the full adult plumage.

Although the individual gull under consideration was kept in an indoor flying cage in a house heated to about 60° throughout the whole of last winter, yet on February 24, the time of the first examination, the early condition of the moult showed that it was normal as compared with the first appearance of black feathers in birds shot in Virginia. From this date on, the bird was confined in an outdoor flying cage, with plenty of room for flight.

*February 24.*—At this time the forehead is almost white, the feathers of this part showing but a small ashy portion near the base of the shaft. Proceeding backward over the crown and occiput, the winter feathers show an increasing amount of ashy color and consequent diminution of white tips to the barbs, until on the nape, the predominance of the former hue produces the effect of the dull nuchal ring of winter. The only feathers which appear loose in their sockets and about to be moulted are the small ones about the eyes. At this examination there are on the head twenty half-grown new feathers, all in a narrow area on the crown, partly

protruding from their sheaths. These are of a uniform dark slate color with conspicuous white tips to all the barbs.

*March 3.*—Considerable change is apparent since last week's examination. Sixteen new feathers have appeared on forehead and crown, all with long white tips. The most marked change is about the eyes, where the white encircling feathers and the dark fluffy, down-like ones at the anterior edge have all appeared and grown to almost full size.

*March 10.*—Hardly any progress in the moult is noticeable since last week. A number of the winter feathers come out at a touch. The severe cold of the past week may have temporarily retarded the moult. An area three quarters of an inch square, on the crown, was cleared of new feathers (three in number) and thirty winter feathers, not much worn and firm in their sockets, were conspicuously marked with indelible ink.

*March 19.*—A very noticeable increase in new feathers has taken place, about eighty having pushed out the winter feathers and showing a full eighth of an inch of dark sheaths beyond the papillæ. Fourteen of the thirty marked feathers have been shed.

The white tips of the score of growing feathers which were observed on February 24 have almost disappeared. From careful comparison with other new feathers in various stages of growth, it appears that these white tips remain until the feather has reached its full size, then not singly, but almost *en mass*, they break off and are lost, never contributing, to any appreciable extent, to the color of the hood.

During the last two weeks a great deal of wear has taken place among the remaining winter feathers. Those on the crown and occiput (including the ink-marked ones) have lost much in symmetry of vane and in number of distal barbs. On the chin and throat, a similar condition of wear and tear is apparent to even a much greater extent, only here it is the bases of the feathers which have suffered most, in many cases having become completely denuded of barbs, while the distal half is still perfect. Everywhere is a scattering of new, half-grown feathers, although those which remain of the old plumage seem as firmly fixed as ever. The most careful search fails to reveal one feather, which, at a glance, cannot be instantly classified either as a worn-out winter,

or a fresh, perfect teleoptile; never a trace of regeneration of barbs or infusion of new color.

*March 29.*—Only three ink-marked feathers are left, the ink being as bright as ever, while in the place of those which have fallen out are the half-grown, slate-colored shafts of the new plumage.

*April 4.*—The moult is well toward completion superficially. All the inked feathers have disappeared, and although the new plumage of the dark hood seems dense and full-grown, yet everywhere new feathers are sprouting, hundreds showing only as tiny bluish sheaths. The half-grown feathers which are as yet protected by the full-grown ones still show conspicuous white tips, but no trace of this is visible in a casual examination of the unruffled surface of the hood; it presents a solid tone of dark slate, except where the few scattered winter feathers still remaining show as flecks of ashy white.

Examination of the growing feathers under a low power lens, with reference to the white tips, shows that all uniformity in extent is absent, except that the white extends down the vane to an equal distance on each side of the rachis. In two nearly-grown but unworn feathers, side by side, the white in one is a mere faint distal fringe, while the other is colorless for fully one-third of the vane. In frequent instances a narrow terminal band of normal dark pigment encloses the broader white area, emphasizing the unstable character of this passing color-phase.

In scores of feathers, from fully-moulted birds, which I examined under moderately high powers, not one barb showed the slender, transparent, slightly flattened tip which characterizes the absolutely unworn barb. So however fresh and perfect the feathers composing the newly acquired hood appear, yet every one has already passed through an important stage of wear. In order to demonstrate fully that the disappearance of the white tips was by wear and not by subsequent infusion of pigment in the growing feather, I inked a number of feathers on the colorless portions and found that the marks invariably disappeared by the time the feather reached maturity.

During the course of the moult the entire sheath of the mandibles peels off; in one case a large piece coming off at once, showing the fresh horn beneath bright carmine in color.